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REVIEW ARTICLE

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V.B.13 | Empty nose syndrome

Empty nose syndrome (ENS) is a rare and complex acquired upper airway disease. "ENS" was coined nearly three decades ago to describe the "empty" or "wide open" nasal cavity examination and imaging in patients following turbinoplasty with excess loss of turbinate tissue or contour.[304,315–319] Clinically, it is characterized by a spectrum of debilitating symptoms like nasal burning, dryness, and crusting, accompanied by symptoms quite unique to ENS like severe suffocation, paradoxical sensation of nasal obstruction, or excessive nasal airflow (i.e., "nose feels too open").[304,320,321]

ENS is linked to several IT reduction approaches, such as total turbinectomy, IT trimming, and radiofrequency ablation.[321,322] Presentation can be immediate or delayed, secondary to over-aggressive IT reduction or suboptimal post-surgical healing and scarring, respectively.[316,323,324] While ENS is mostly associated with inferior turbinoplasty (ENS-IT), ENS from MT tissue loss (ENS-MT) has been reported.[317]

The physiologic basis for perceiving reduced and/or unpleasant nasal breathing may be related to altered signaling through trigeminal sensory receptors, specifically TRPM8. Resultant aberrant thermosensation and neurosensory deprivation manifest as muted airflow sensation.[325–330] Damage to, and/or delayed recovery of, the trigeminal sensory nerve has also been implicated in the development of ENS in a minority of patients.[331] Additionally, objective shifts in nasal airflow support a novel "aberrant airflow" hypothesis.[332–334] Computational fluid dynamics modeling of nasal airflow demonstrates abnormally high velocity airflow to the middle meatus and dampened airflow vectors to the inferior meatus in ENS.

There has been welcome progress in the diagnosis and treatment of ENS in the past decade. In addition to a history of nasal surgery and abnormally expansive unilateral/bilateral nasal airway with concomitant IT tissue loss, thickened central nasal septum mucosa has been shown to be present in longstanding ENS.[323] The validated patient reported outcome measure Empty Nose Syndrome 6-item Questionnaire (ENS6Q) can be used to quantify the severity of six cardinal ENS symptoms on a 5-point Likert scale. A score ≥11 indicates ENS.[320] Placement of a cotton plug in the inferior meatus to simulate turbinate bulk (the cotton test) has been validated as an office-based tool to assess/alleviate ENS symptoms.[335] A positive blinded cotton test both confirms the ENS diagnosis and informs candidacy for possible treatment interventions.[335]

ENS has historically been a challenging disease to effectively treat due to debilitating nasal symptoms and, in a minority of patients, concerning psychiatric overtones.[336–340] Past therapies were confined to reducing the daily burden of ENS symptoms via nasal maintenance strategies including moisturizers and emollients, increasing nasal airflow (supplemental oxygen, CPAP [continuous positive airway pressure] use), and psychiatric interventions like cognitive behavioral therapy.[341,342]

Current published interventions focus on restoring tissue volume to the truncated ITs or the adjacent inferior meatus. Submucosal injection of slow-resorbing gel fillers can be trialed for the effect of "transient turbinate augmentation" lasting 1–3 months.[343] A wide variety of biomaterials – including acellular dermis, implants, and xenografts – have been published as bulking options to sites of inferior meatus and IT tissue loss.[344–349] Importantly, a procedure originally reported by Houser,[318] now termed the inferior meatus augmentation procedure (IMAP), where missing turbinate contour is replaced with fashioned rounded rib grafts placed in the anterolateral nasal airway, has accumulated strong evidence for effectively treating ENS.[350] IMAP has yielded statistically significant short[351] and long[352] term reductions in the ENS6Q and the Sinonasal Outcome Test (SNOT)-22. Mechanistically, comparing computational fluid dynamics airflow modeling pre/post-surgery, the cotton test and IMAP procedures both normalize disordered vectors of ENS airflow,[353] highlighting a novel function of the turbinates in guiding and/or enhancing nasal airflow. Future ENS research will determine anatomic versus physiologic prognostic factors to identify "at risk" subpopulations for developing ENS[336,337] and design more nuanced airflow metrics for upper airway function in health and disease.

V.B.14 | Autoimmune, granulomatous, and vasculitic rhinitis

Differential diagnosis. Vasculitic, granulomatous, and autoimmune diseases may cause non-specific sinonasal symptoms (e.g., nasal obstruction, rhinorrhea, facial pain, and loss of smell) often mimicking AR. Therefore, broadening the differential diagnosis to consider systemic etiologies when evaluating these sinonasal symptoms is crucial. Crusting, recurrent epistaxis, or negative skin and/or blood allergy tests are among the signs that should heighten one's suspicion of alternative systemic diseases.[354,355]

Granulomatosis with polyangiitis (GPA). This is an uncommon disease with highest prevalence amongst people of Northern European descent, with men and women equally affected and incidence peaking in the seventh decade of life.[356] It is a chronic, relapsing, and idiopathic disease characterized by necrotizing and granulomatous inflammation affecting predominantly small to medium

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